Recommended Total Time: 2 hours

Integrate Costs

In Unit 2 you determined the relative risks of flood, wind, earthquake and fire to four communities: Tulsa, OK; Kansas City, MO; Oakland / San Francisco, CA; and Wilmington, NC.

Review Unit 2 and 3 Overview of Unit 4 Time: 10 min.

You will use your Unit 2 conclusions shown in the Relative Risk Levels Table on page 4-8.

Unit 2: Risk Levels Table

Unit 3: Hazards Considered Separately and Measures Marked on Action Checklist

In Unit 3 you identified various cost-effective mitigation measures that could be implemented at a selected property for each of the four selected natural disasters, with each considered separately. You marked all your desired mitigation measures on your Action Checklist. However, as the Relative Risk Level Table indicates, communities face multiple hazards at varying risk levels. Clearly, you need to focus on implementing mitigation measures that address the more serious hazards for your area and their associated risks.

The most important mitigation measures protect against risk: first to life, and then to property. To protect property, in general, emphasize enhancing the building integrity of the home. However, for fire, your priority concern is to keep the fire away from the home.

New Actions

In this unit you are going to perform several more actions and integrate their results into what you have already done. Then you will choose appropriate mitigation measures for the home:

- Consider the effects of costs on your recommendations
- Choose among mitigation measures when there are multiple hazards
- Integrate the WAP and this program

Get Cost Sheet

The Cost Sheets on pages 4-10 to 4-13 show the costs of implementing each mitigation measure on the Action Checklist. You need to make sure the cost of implementing your recommendations for each home does not exceed the budgeted amount according to the program implemented in your region.

You should factor in the availability of resources available from other programs and sources.

Cross-hazard benefits

When there are multiple hazards, there may be crossover benefits from some mitigation measures that particularly enhance their benefit to the homeowner.

For example, the Sanders Valve protects both life and property from flood and earthquake risks.

Effects of WAP and other resources

You also need to consider the effects of your WAP recommendations and their costs for additional crossover benefits.

For example, if the windows are reinforced under the WAP, you might use the Hazard Identification and Mitigation program to add shutters in preference to another possible mitigation measure. Or, if the WAP can fund part of the cost of clearing vegetation, this program could fund the rest.

Also consider what other available resources could benefit this homeowner and family. Consider how you might combine all resources to provide the greatest possible benefits.

In the following practice exercises, you will consider which mitigation measures to implement for the same home located first in Tulsa, OK; then in Kansas City, MO; then San Francisco/Oakland, CA; and last, in Wilmington, NC.

> Note: This is not like in the field, where you will be in just one geographical area, but this way is most adaptable for our classroom exercise.

Use the Action Checklist with your marked recommendations on page 3-2.

Guided Practice

Determine your recommended mitigation measures.

Critical Steps in the Process

The critical steps for figuring out which mitigation measures to recommend for a particular home are:

1. Identify the relative risks to your locality for each natural hazard. (Tools are available from FEMA, such as a FIRM for flooding and a wind map; the USGS for maps for earthquake risk, and the National Wildland/Urban Interface Fire Protection Program for a Peak Fire Seasons map.)

2. Focus your assessment on the hazards that offer the highest relative risks to your area.

3. Identify appropriate mitigation measures for the home you are inspecting. Mark all your identified mitigation measures on the Action Checklist.

4. Consider the impact of local codes on your choices.

5. Consider the possibility of using other funds and programs to supplement this program.

6. Use the Cost Sheet to determine the cost of implementing those mitigation measures.

7. Consider the effect of the WAP on your choices.

8. Decide which measures on the Action Checklist have the greatest effectiveness.

9. Talk to the homeowner. As you leave, express your thanks for allowing your visit.

Time: 30 min.

Determine Costs

Verify Understanding

For our exercises, you will be limited to spending $800 on this home.

Note: The actual limit or guide for the program implementation in your region may vary.

Refer to the Relative Risk Levels from Selected Natural Disasters table on page 4-8 for the following questions.

For Tulsa, OK

Ask:

1. Which relative risks are highest for Tulsa?

On your Action Checklist for all the measures you checked:

(To save time, omit 2, 3 and discussion, however at least two scenarios should be costed.)

2. Determine the cost of implementing each by referring to the Cost Sheet and including any donated services/materials.

3. Does the total cost exceed your budget for this program?

Discussion	• Discuss relative merits of various measures participants have recommended. • Suggest the Inspector might want to spend more on a home. What justification should be provided to the Supervisor?
For Kansas City, MO	Ask: 4. Which relative risks are highest for Kansas City? On your Action Checklist for the measures you checked:
(To save time, omit 5, 6 and discussion, however at least two scenarios should be costed.)	5. Determine the cost of implementing each by referring to the Cost Sheet and including any donated services/materials. 6. Does the total cost exceed your budget?
Questions/Discussion	Encourage questions and have participants explain their reasoning.
For San Francisco / Oakland, CA	Ask: 7. Which relative risks are highest for SF/Oakland? On your Action Checklist for the measures you checked:
(To save time, omit 8, 9 and discussion, however at least two scenarios should be costed.)	8. Determine the cost of implementing each by referring to the Cost Sheet and including any donated services/materials. 9. Does the total cost exceed your budget?
Questions/Discussion	Encourage questions and have participants explain their reasoning.
For Wilmington, NC	Ask:
When risk rankings are similar the inspector should select mitigation measures that can be combined or installed at the same time.	10. How will you determine where to concentrate your recommendations when the relative risk rankings are very similar? For example, The Relative Risk Levels Table shows Wilmington, NC has medium risk for flood; medium high risk for wind; low medium risk for earthquake; and medium risk for fire.
Final Practice Exercise	On your Action Checklist for the measures you checked:

11. Determine the cost of implementing each by referring to the Cost Sheet and including any donated services/materials.

12. Does the total cost exceed your budget?

Time: 30 min.

Integrate the WAP Recommendations and Other Programs; Consider Relative Benefits

In Unit 3: The Exercise House has many measures checked for every hazard, narrow the number to two in each. The situation for each home is different and determined only by an inspection, so this limitation of the problem is realistic.

Integration with WAP

Consider the effects of the WAP on your recommendations.

Refer to kinds of work performed under WAP

Consider how work done under other program resources and how the WAP and this HI & M program may have related aspects. Therefore, when work is being done under one program, another governmental program's resources and other private sources might also be used to greatest advantage to the homeowner.

For example, when the WAP work is for roofing, appropriate mitigation measures under Hazard Identification and Mitigation might include:

204: Increase end gable fastening/bracing
205: Replace gable vent with slotted or power vent
206: Fasten roof to walls as feasible
207: Improve securing of roof sheathing
404: Cover windows, vents and skylights with non-flammable ½" screening mesh
405: Use fire resistant construction materials for repairs/modifications to property

Discussion

- Ask participants to provide other examples.
- Discuss participants' responses and their reasoning.

Time: 10 min.

Make Final Decision

- Consider various combinations of how to use all available resources most effectively for the homeowner.
- Decide which measures on the Action Checklist have the greatest benefit. Circle them.

Application Exercises	What mitigation measures and why would you recommend for the home in A. Tulsa? B. Kansas City? C. San Francisco / Oakland? D. Wilmington?
Final Questions	Ask if participants are ready for a final exercise. Respond to questions.
Verify Understanding	Directions: Change the data for Wilmington, NC, so the risk from flooding is high. Keep all other risk information the same.
Final Exercise Time: 20 min.	What mitigation measures will you recommend for this home? Why?
Discussion of the Recommendations Time: 10 min.	Ask what recommendations were recommended and why. Discuss any variations in responses.
Close Time: 10 min.	• Thank participants for their contributions. • Ask them to complete the evaluation sheet.

Relative Risk Levels from Selected Natural Disasters				
	Tulsa, OK	Kansas City, MO	San Francisco / Oakland, CA	Wilmington, NC
Risk from:				
Flood*	Low	High	Low	Medium
Wind	High	High	Low	Medium High
Earthquake	Low	Low	High	Low Medium
Fire	Medium	Medium	Low	Medium

***** The risk due to flooding varies from structure to structure and is determined by the depth of flooding in the structure.

Participant Work Sheet

Cost Sheets – Estimates for the Fact Sheet mitigation measures.

Material costs were developed using RS Means and estimates from selected home improvement stores. Labor costs were estimated based on a ratio to material cost of 1:1 that is used for WAP. In unique situations where machinery and crew labor is required a greater multiplier times materials was utilized.

FLOOD

Mitigation Measure	Description of Mitigation Measure	Estimated Cost		
		Materials	Labor	Total
101	Install gasketed well head cover with bolts	$100-$150	$100-$150	$200-$300
102	Clean gutters and storm drains and purchase and install gutter guard	$35-$50	$70-$100	$100-$150
103	Install gas safety cut-off valve to interior gas line	$200-$250	$150-$250	$350-$500
104	Anchor/elevate external fuel and Air Conditioning units	$300-$400	$300-$400	$600-$800
105	Anchor homes to foundation	$80-$100	$160-$200	$240-$300
106	Apply protective sealants to exterior and below-grade walls	Sealant $700-$800 for 240 sq. ft. Metal flood shields $73 per sq. ft. Wood shields $23 per sq. ft.	$100-$800	$200-$1,600
107	Buy and install septic backflow valve	$100-300	$300-$900	$400-$1,200
108	Buy and install floating drain plug in first floor	$30-$40	$60-$80	$90-$120
109	Build interior walls around critical utilities	3-ft. high wall with a 35-ft. perimeter $300-$500; Submersible pump $60-$100	$200-$500	$300-$1,000
110	Move internal utilities/appliances to another floor or elevate in-place requiring an electrician and laborers for the heavy lifting	$50-$140	$500-$1,000	$600-$1,100

WIND

Mitigation Measure	Description of Mitigation Measure	Estimated Cost		
		Materials	Labor	Total
201	Trim, prune, and/or remove tree limbs and whole trees [Reduce potential for flying debris (i.e., anchor sheds, equipment, and miscellaneous materials)]	No materials needed-only tree professional service	$300-$500	$300-$500
202	Buy and install galvanized metal plating or strapping to secure home to foundation	$5.00-$7.00 for 50 ft. ($250-$300)	$250-$300	$500-$600
203	Uncover wall framing in order to screw or otherwise attach frame to foundation of regular or non-manufactured homes	$125-$175	$250-$350	$375-$525
204	Install 2x4s to brace end gables, galvanized fasteners to further secure the gables, and 16d nails or screws	$30-$40	$45-$60	$75-$100
205	Install slotted or power vents to replace older gable vents	$150-$200	$150-$200	$300-$400
206	Install hurricane straps in order to fasten the roof to the home walls	$40-$120	$100-$300	$140-$420
207	Install 16d nails to improve securing of sheathing to roof. High-strength adhesive AFG01	$30-$50	$100-$200	$130-$250
208	Add or replace door bolts and add or replace door hinges Apply impact resistant safety film to windows.	Door- $10 to $40; Adding safety coating to glass: $5.00 per sq. ft.	Door- $10-$40; Safety Film- $100-$200	$20-$300
209	Create a safe area within your home to protect people	$250-$500	$250-$500	$500-$1,000
210	Install 2x4s to brace trusses of A frame homes	$40-$50	$60-$75	$100-$125

EARTHQUAKE

Mitigation Measure	Description of Mitigation Measure	Estimated Cost		
		Materials	Labor	Total
301	Install gas safety cut-off valve to interior gas line	$200-$250	$150-$250	$350-$500
302	Install bracing for a manufactured home	$5.00-$7.00 for 50 ft. ($250-$300)	$250-$300	$500-$600
303	Install metal plates and bolt to connect house sill plate to foundation	$125-$225	$250-$450	$375-$675
304	Brace cripple walls with rebar and grout for masonry units and extra courses of brick?	$200-$350	$400-$700	$600-$1,050
305	Install steel straps and angle bracing to go around chimneys and bolt the non free standing straps to the exterior walls	$500-$800	$500-$800	$1,000-$1,600
306	Install flexible piping for appliances and utilities. Buy and install angle bracing for overhead pipes	$75-$300	$50-$100	$125-$400
307	Install steel straps to strap the water heater to wall studs or concrete anchors for masonry walls.	$80-$100	$80-$100	$160-$200
308	Install lengths of heavy to medium strength chains and bolt them around propane type fuel tanks, or buy lightweight chains for counter top appliances or TVs, or buy steel straps to anchor wood stove flues and bolts to bolt wood stoves to the floor	$20-$50	$20-$50	$40-$100
309	Install bolts and brackets to bolt down bookcases and steel bands to keep shelf contents from sliding off	$5-$15	$10-$30	$15-$45
310	Improve or secure wall sheathing	$125-$175	$250-$350	$375-$525

FIRE

Mitigation Measure	Description of Mitigation Measure	Estimated Cost		
		Materials	Labor	Total
401	Hire two landscape professionals for removing vines from walls and creating a zone around the home free of underbrush and dead leaves	N/A	$100-$150	$100-$150
402	Relocate/Protect exterior, above-ground fuel tank(s) and reconnect the service lines	$100-$150	$300-$450	$400-$600
403	Maintain gutters, eaves, and clear roof of leaves and woody debris	N/A	$70-$100	$70-$100
404	Install non-flammable, or replace flammable, window and door screens with ½-inch or less screening mesh	$25 for windows, $75 for doors,	$50-$75	$70-$150
405	Replace existing roofing material with tile, metal, or slate roofing (cost are averages based upon roof area and are all inclusive)			$4 per square foot for tile or metal roofing, $7 per square foot for slate
406	Spigot and 10 ft. Copper piping Nozzle and 100 ft. Hose	$40-$50	$80-$120	$120-$170
407	Buy and install smoke and carbon monoxide detectors; to hard wire one in-place, an electrician is needed	$5-$40	$25-$50	$30-$90
408	Install 1 fire extinguisher	$20-$60	$10-$15	$30-$75
409	Install a chimney spark arrester, hire a tree professional to trim/cut tree limbs and branches to keep them a safe distance from the chimney opening	$30-$50	$50-$150	$80-$200
410	Clean chimney (only the service required)	N/A	$60-$65 brush, $250 -$500 mechanical cleaning	$60-$500